

The effect of aquatraining and dry treadmill training on muscle morphometric and muscle metabolomics in horses.

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Background: Little is known about the effect of training on muscular metabolism and morphometry because of a lack of standardized equine studies. **Objectives:** (1) comparing muscle morphometric changes induced by dry treadmill training (DT) versus aquatraining (AT), (2) comparing metabolic profiles of the muscle pectoralis profundus (PP) and vastus lateralis of the quadriceps femoris (QF) in dry treadmill trained Friesians (DT_{after}), untrained Friesians (DT_{before}) and untrained Warmblood horses. **Study design:** Prospective clinical study **Methods:** Twelve untrained Friesians were subjected to 2 different training programs: 7 horses completed 8-weeks of AT, 5 horses a DT training program. Morphometric assessment of 15 muscles was performed at start, after 4 weeks and at finish using ultrasound. Muscle biopsies were harvested from the DT_{before} and DT_{after} group at start and finish from the PP and the QF. Metabolomic profiling was performed by (RP)/UPLC-MS/MS and HILIC/UPLC-MS/MS. **Results:** (1) AT increased muscle diameter of the cervical and thoracic part of the trapezius muscle, brachiocephalicus, QF, semitendinosus, semimembranosus and the thoracic part of the erector spinae (2) DT significantly increased long chain and decreased medium chain acylcarnitines in PP and QF. Early and late stage glycolytic intermediates and pentose-phosphate pathway intermediates were significantly increased in the QF. A significant increase in oxidized glutathione and intermediates of the glutamine/glutamate metabolism and decrease in glycine and acetyl-glycine was found in the PP ($p < 0.05$). **Main limitations** The effect of AT on muscle metabolomics was not studied yet. **Conclusions:** AT causes hypertrophy of muscles in the forelimb, back, and hindlimb, particularly muscles involved in forelimb elevation and forward movement, flexion of the hindlimb and muscles used for spine extension. Following 8 weeks of DT, an upregulation of fat oxidation and glycolysis in QF muscle was shown, while the muscle PP showed an upregulation of fat oxidation and amino acid metabolism.

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